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"ALLEMONTITE" FROM ATLIN, B. C.[1]

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In October, 1917, the writer obtained from the late Captain James Alexander of Atlin, B. C., some specimens from the Engineer Mine, of which he was the proprietor. The property in question contains exceedingly rich gold ore in quartz veins along with "allemontite" and native antimony. According to Cairnes[2] these veins carry tellurium, but he does not give any chemical analyses to support this view. Some pieces of the richest gold ore were, at the writer's suggestion, tested by Mr. J. E. Thomson for tellurium with negative results. In order to indicate the exceeding richness of this ore I quote from Captain Alexander's letter: "I am sending you a piece of $100,000 ore which comes in connection with the allemontite. . . . The gold values vary from $50.00 to 3000 ounces per ton." Mr. George A. Clothier, provincial government mining engineer for this part of British Columbia, in his annual report to the Minister of Mines, states: "The record run of this mill was 24 lbs. 8 oz. (troy) of gold from 160 lbs. of ore. . . . Altogether it is a wonderful showing of gold and there is every reason to believe that it can be developed into one of the greatest gold producers of the continent."[3]

This statement regarding a mill run refers to the treatment of small quantities of picked ore such as they were able at the time to treat with available appliances.

The presence of "allemontite" in these deposits has been known to the operators and to the provincial Department of Mines for some years but so far as the writer is aware it has never been referred to in the literature. The following examination was undertaken to determine the character of the mineral and to call attention to the first occurrence of "allemontite" in Canada.

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[1] Presented at the meeting of the Mineralogical Society of America, Dec. 28, 1920. [Another "species" is fully discredited! ED.]

[2] Cairnes, D. D. *Memoir, Geological Survey of Canada,* No. **37**, 74, 1913.

[3] Clothier, G. A. *Annual Report of the Minister of Mines, Victoria,* **1918**, 91–92.

The specimen from Captain Alexander exhibits beautiful mammillary structure, a characteristic of this mineral from other localities. (See frontispiece.) Its specific gravity was found to be 6.05 and on the freshly broken surface it was tin-white in color. A chemical analysis of this material is shown in III, table 1.

In the summer of 1919 the writer visited the Engineer Mine and collected a little more of the "allemontite" and packed it along with other specimens in a wine cask. After two months the specimens reached Toronto, and, when unpacked, it was noted that the mineral had become tarnished—probably as a result of vapors from the fermented liquor. When cross-sections of the mammillary masses were examined it was found that some layers had taken on a red-brown tarnish while others were either steely-metallic or white pulverulent. The layers showing the brownish tarnish were coarsely mammillated while the others were finely mammillated or almost pimply. Three portions according to the differentiation shown by the tarnish were separated for specific gravity determination and chemical analysis, as shown in I, II, and IV, table 1.

TABLE 1. ANALYSES OF "ALLEMONTITE."

		I.	II.	III.	IV.
As		87.98	82.54	70.08	42.69
Sb		10.97	17.74	28.68	57.06
S		—	—	0.25	—
Au		—	—	0.05	—
Totals		98.95	100.28	99.06	99.75
Sp. Gr.	obs.	5.80	5.92	6.05	6.34
	calcd.	5.81	5.88	5.99	6.27

I. Dull reddish brown on tarnished surface, coarsely mammillary.

II. Dull gray on surface, coarsely mammillary.

III. Fresh, not selected with reference to tarnish or coarseness of structure.

IV. Bright metallic or light gray on exposed surfaces, finely mammillary.

The calculated specific gravities are based on the values: As 5.70, Sb 6.70.

Mr. J. E. Thomson, who examined some cross sections thru the "allemontite" by mineragraphic methods, informs me that even with high power there was always a distinct banding apparent.

From the above observations on this supposed allemontite it appears that:

(*a*) There is a regular increase of specific gravity with the percentage of antimony present, the close agreement between the observed values and those calculated from the composition indicating the lack of combination between the constituents.

(*b*) The more readily tarnished varieties contain most arsenic and assume more coarsely mammillary forms.

(*c*) The "allemontite" is really an intergrowth of successive layers of arsenic and antimony, and not a definite chemical compound, nor even an isomorphous mixture.

Dana assigns to "allemontite" the formula As_3Sb, which requires 34.8 per cent. of antimony. Hintze[1] gives six analyses of this mineral with the following percentages of antimony:—37.85, 16.00, 9.18, 9.27, 7.97 and 4.29. From this series of analyses it is apparent that there is no evidence of constancy of chemical composition, nor of any definite ratio between the constituent elements. The results obtained on the material from Atlin are in harmony with the series quoted by Hintze.

The writer inclines to the opinion that allemontite is not a distinct mineral species and urges that, as has been suggested by others[1] but not widely acted upon, the name should be dropped from mineralogical literature. Since arsenic is usually in considerable excess, the material may be labeled *antimoniferous arsenic.*

NOTES AND NEWS

The Senckenbergische Naturforschende Gesellschaft, Viktoria-Allee 7, Frankfurt am Main, Germany, has on hand a large series of specimens illustrating the metamorphic minerals produced by the intrusion of basalt, and masses of native iron in this rock, from Bühl, Weimar, Cassel. They invite correspondence from collectors who may be interested in obtaining series of these specimens.

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[1] Hintze, C. *Handbuch der Mineralogie*, Vol. 1, 114.

[2] Compare Wherry, Edgar T. The nomenclature and classification of the native element minerals. *J. Wash. Acad. Sci.*, 7, 451, 1917.

SPECIFIC GRAVITY AND COMPOSITION IN IRON-RUTILE

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Schaller, in his study of the rutile group,[1] has shown that the iron-rutiles, known as "nigrine" and "iserite,"[2] are isomorphous mixtures of two tetragonal end members, titanyl titanate, $TiOTiO_3$, or rutile; and ferrous titanate, $FeTiO_3$, which is unknown as a mineral species, altho its rhombohedral form, ilmenite, is well known. From a study of six analyses, Schaller concluded that the specific gravity of the hypothetical $FeTiO_3$ could be determined no more definitely than as 5 ± 0.25. His calculations of the sp. gr. of ferrous titanate were obtained by assuming a value (4.20) for that of rutile; and from the percentage, by weight, of $FeTiO_3$, determining its sp. gr. from those of the several isomorphous mixtures. In this way he obtained the values: (1) 5.3; (2) 5.1; (3) 5.3; (4) 5.0; (5) 5.4; (6) 4.74 for the density of ferrous titanate; determined from iron-rutiles containing respectively: (1) 8.0; (2) 12.8; (3) 18.8; (4) 31.0; (5) 30.0; and (6) 64.0 per cent. by weight of $FeTiO_3$.[3] Two of the analyses which he used seem inaccurate, and not suited for calculation.[4]

The object of the present paper is a study of the iron-rutiles, with special reference to the sp. gr. of the two end members of this isomorphous series. Those respective sp. grs. of titanyl and of ferrous titanates, which together give the closest agreement between calculated and observed sp. gr. of the isomorphous mixtures, have been determined by the method of least squares. The sp. gr. of each mixture was calculated by the following formula:[5]

$$D = d + a(d' - d)/100,$$

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[1] Schaller, W. T. A Study of the Rutile Group. U. S. Geol. Survey *Bull.* **509**, 9–39, 1912.

[2] Schaller proposes that the names nigrine and iserite should be discarded, as the minerals bearing them have no claim to specific rank. Instead, they should be described as iron-rutiles. Iserite should not be confused with the rhombohedral "iserine," at times also called iserite. [The editor would prefer to call these minerals *ferriferous rutiles.*]

[3] The first, second, third, and sixth of these correspond respectively to analyses 5, 4, 6, and 7 in table 1.

[4] These are respectively the fourth and fifth of those mentioned above, and are from Ohalpian, Transylvania (Rammelsberg, *Mineralchemie* 1009, 1860) and Barien (Müller).

[5] Groth, P. and Marshall, H. *Chemical Crystallography*, 90, 1906.

in which D is the density (or sp. gr.) of the isomorphous mixture (which is to be determined), d and d′ the densities of the two end members, and a the volume percentage of the second substance present in the mixture.

Seven apparently dependable analyses of rutile, accompanied by determinations of sp. gr., were found by the author. Of these, four had been used by Schaller in his discussion of the series; the two inaccurate analyses mentioned above were not further considered. Table 1 gives those used in this investigation, arranged in order of increasing specific gravity.

TABLE 1. ANALYSES OF RUTILE

	1	2	3	4	5	6	7
TiO_2	97.60	98.47	96.75	91.96	94.93	89.49	70.03
Fe_2O_3	1.55	0.72	2.40	6.68	——	11.03	——
FeO	——	——	——	——	3.77	——	28.77
SnO_2	——	——	——	1.40	——	——	——
MgO	——	——	——	——	——	0.45	——
SiO_2	——	——	——	——	1.37	——	——
H_2O	——	——	——	——	0.71	——	——
Sum	99.15	99.19	99.15	100.04	100.78	100.97	98.80
Sp. gr.	4.209	4.240	4.242	4.249	4.288	4.410	4.520

1. St. Yrieix, Haute-Vienne, France. Damour, *Ann. chim. phys.* **10**, 414, 1844. Deville (*Compt. rend.* **53**, 161, 1861), found 0.32% V_2O_5, 0.49% MoO_3, and a trace of SnO_2 in rutile from this locality.
2. Villeneuve-en-Montagne, Saone-et-Loire, France. Virlet, *Bull. soc. géol. France* **3**, 25, 1846.
3. Freiberg, Saxony. Kersten, *J. prakt. Chem.*, **37**, 170, 1846.
4. El Paso Co., Colo. Genth and Penfield, *Am. J. Sci.*, [4] **44**, 384, 1892.
5. St. Peter's Dome, Colo. Smith, *Proc. Colo. Sci. Soc.*, **2**, 175, 1887.
6. Bernau, Bavaria. Rammelsberg, *Mineralchemie*, 1008, 1860.
7. Iser, Bohemia. ("Iserite") Janovsky, *Sitzb. Ak. Wiss. Wien*, **80**, 34, 1886.

In those analyses in which iron had been determined in the ferric condition, Fe_2O_3 was converted to FeO, assuming that the mineral was pure. FeO and TiO_2 were recalculated to 100%; this does not materially affect the calculated sp. grs., since the proportion of impurities is small, and for the whole series those impurities causing an increase and those causing a decrease in sp. gr. practically balance each other. From the percentages of FeO and TiO_2 those of $FeTiO_3$ and $TiOTiO_3$ were calculated, and the percent. by weight of $FeTiO_3$ was converted to percent. by volume. The sp. gr. for each analyzed rutile was calculated as explained above. It was found that the closest agreement between calculated and observed sp. grs. was obtained when that of $TiOTiO_3$ was taken as 4.23, and that of $FeTiO_3$ as 4.77.

The method used for arriving at these values for the end-members was as follows: Preliminary trial having shown that Schaller's value for rutile was slightly too low, and that for the ferrous titanate decidedly too high, calculations were made with three different values for rutile, 4.22, 4.23, and 4.24; and five for $FeTiO_3$, 4.75, 4.76, 4.77. 4.78, and 4.79. The differences between the observed sp. grs. and those calculated from each pair of values were determined; and the sum of the squares of these differences was obtained, as given in table 2.

TABLE 2. VALUES OF $\Sigma(v^2)$

Sp. Gr. of $FeTiO_3$	Specific Gravity of TiO TiO_3		
	4.22	4.23	4.24
4.75	———	.010111	———
4.76	.010443	.010108	.010751
4.77	.010564	.010083	.011075
4.78	.010544	.010403	.011123
4.79	———	.010564	———

The sum of the squares of the individual errors is thus seen to be least for the values 4.23 and 4.77, respectively, and these are the ones used in table 3.

The results for these values are given in table 3.

TABLE 3. CALCULATED SPECIFIC GRAVITIES OF IRON RUTILES.
Sp. gr. of $TiO.TiO_3$ = 4.23, of $FeTiO_3$ = 4.77.

No. of Analysis	Recalculated to 100 Per Cent.		Per Cent by Weight		Per Cent. by Volume		Sp. Gr.		Error
	FeO	TiO_2	$FeTiO_3$	$TiOTiO_3$	$FeTiO_3$	$TiOTiO_3$	Obs.	Calcd.	(v)
1	1.40	98.60	2.98	97.02	2.65	97.35	4.209	4.244	+.035
2	0.66	99.34	1.39	98.61	1.24	98.76	4.240	4.237	−.003
3	2.18	97.82	4.60	95.40	4.10	95.90	4.242	4.252	+.010
4	6.13	93.87	12.95	87.05	11.65	88.35	4.249	4.293	+.044
5	3.82	96.18	8.07	91.93	7.23	92.77	4.288	4.269	−.019
6	9.99	90.01	21.10	78.90	19.17	80.83	4.410	4.334	−.076
7	29.12	70.88	61.50	38.50	58.60	41.40	4.520	4.546	+.026

It can be seen from table 3 that the calculated and observed sp. grs. agree as well as could be expected, when the difficulty of the analysis of rutile is considered, as well as the fact that the temperatures at which the sp. grs. were determined were not given in any case.

The probable error[1] of these results is ±0.027, the average error ±0.0305. Therefore the sp. gr. of tetragonal ferrous titanate may be given as 4.77 ± 0.03; and that of titanyl titanate, or pure rutile, as 4.23 ± 0.03. Evidence for the accuracy of these determinations is found in the close agreement between the calculated value of the sp. gr. of rutile, 4.20–4.26, and that value as commonly accepted, given by Dana as 4.18–4.25, by Miers as 4.22, and by Rosenbusch as 4.20–4.25.

Finally it has seemed of interest to plot (Fig. 1) the sp. gr.—composition curve of the iron rutiles studied, taking the values of the Fe and TiO end members as 4.77 and 4.23 respectively. The diagram shows a straight line relation between volume percentage and sp. gr. This clearly indicates that isomorphous mixtures of the ferrous and titanyl titanates are represented in iron rutile.

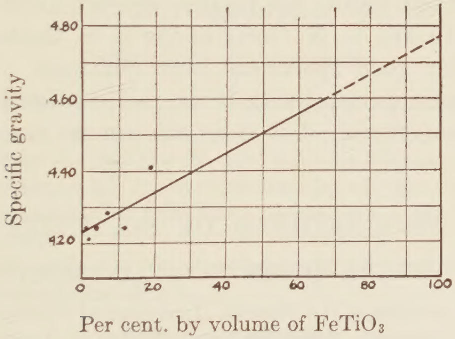

FIG. 1. SPECIFIC GRAVITY—COMPOSITION CURVE OF IRON RUTILE

A UTAH FELDSPAR LOCALITY

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Much has been written about Utah's ores and minerals from a commercial standpoint, but that is of little aid to the collector, and as there are not many here in Utah interested in collecting mineral specimens, the good localities have not been fully explored.

The Big and Little Cottonwood mining districts, in Salt

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[1] As determined by the formula: $r = \pm \frac{2}{3}\sqrt{\frac{\Sigma(v^2)}{n-1}}$, where r = the probable error of any single calculated result and n = number of observations (7).

Lake County, afford some rich fields for the mineralogist. The one here mentioned is a feldspar occurrence, and is situated near the mouth of the former canyon on a high spur or ridge lying between the two, parallel with the main streams.

The crystals are extremely abundant in the rock. They are the common type of orthoclase feldspar, few being twinned. They range in size from 5 millimeters up to 8 centimeters. To secure good specimens requires considerable skill and patience, as the crystals adhere to the rock, which makes it very difficult to get them out whole.

About 1½ kilometers (one mile) further up Big Cottonwood canyon, on the opposite side, a finer grained rock occurs which is more decomposed, so the crystals can be broken out much easier, and better ones can be obtained. They average smaller in size but show fine smooth faces.

The writer has visited the locality several times; the last trip was made with Mr. C. N. Gerry of the U. S. Geological Survey, and some very good specimens were obtained. The only obstacle one has to contend with is the rattlesnakes that infest the ledges and underbrush, but they are not so numerous of late years.

PROCEEDINGS OF SOCIETIES

NEWARK MINERALOGICAL SOCIETY

At the April meeting of the Newark Mineralogical Society there was a fair attendance of members. After the usual routine of business and the acceptance of two new members, Mr. Lee proceeded with his paper on "Tungsten and its Ores." This proved to be one of the most interesting papers ever presented before the Society. After enlightening us on the various ores, Mr. Lee gave demonstrations on chemical tests for tungsten, during which he produced synthetic scheelite and tungstate of silver, the latter unknown in nature. A vote of thanks was tendered Mr. Lee at the end of his talk.

Wm. H. Broadwell, *Secretary.*

PHILADELPHIA MINERALOGICAL SOCIETY

Academy of Natural Sciences of Philadelphia, April 14, 1921

A stated meeting of the Philadelphia Mineralogical Society was held on the above date with the president, Dr. Hawkins, in the chair. Fifteen members and three visitors were present. Upon recommendation by the council the following were elected active members: Brother Lucian, and Dr. Frank O. Eriksson.

Mr. John Frankenfield read an interesting paper on "Chemical Crystallography" illustrated with a number of crystallized mineral specimens.

The secretary called attention to a collection of Perkiomenville minerals presented by Messrs. Hilbiber and Tallis, which was exhibited in a case in the rear of the meeting room. Mr. Hilbiber described the making of the collection which includes fine specimens of andradite, epidote, pyrite, stilbite, epidesmine, heulandite, chabazite, and calcite.

Mr. Trudell presented an account of the Society's successful trip to Perkiomenville on April 10, attended by Messrs. Hilbiber, Tallis, Gordon, Frankenfield, Hagey, Knabe, Vanartsdalen, and Boyle. The society then adjourned to the mineral hall. Samuel G. Gordon, *Secretary.*

NEW MINERALS

A list of new minerals has recently been published by Arthur Schwantke, (Marburg, Hessen) in the publication of the German Mineralogical Society, *Fortschr. Min. Krist. Petr.*, **6**, 67–100, 1920. This list includes species described or discredited since the appearance of a previous list by the same author (**4**, 161–174, 1914) as well as a few earlier ones missed in the latter. We have already noted all but one of those dating from 1916 on; this is abstracted below.

FAMILY 9. SILICATES, ETC.

Anhydrous metasilicates

Aegirite-hedenbergite. [Hédenbergite aegyrinique]

A. Lacroix: Les phénomènes de contact exomorphes et endomorphes des granites à aegyrine et riebeckite du nord-ouest de Madagascar. (The exomorphic and endomorphic contact phenomena of the aegirite-riebeckite-granite of northwestern Madagascar.) *Compt. rend.*, **163**, 726–731, 1916; this mineral, p. 728.

Name: From aegirite and hedenbergite, the two minerals of which it represents an isomorphous mixture.

Physical properties

Color green. Sp. gr. 3.502. Otherwise like the pyroxenes in general.

Chemical properties

Analysis by Pisani gave: SiO_2 42.15, Al_2O_3 0.55, Fe_2O_3 17.40, FeO 17.80, MnO 0.50, MgO 1.10, CaO 14.10, Na_2O 3.35, K_2O 0.55, TiO_2 0.41, H_2O 1.90, sum 99.81%. This is suggested to correspond to the formula $15(Ca, Fe, Mg)_2(SiO_3)_2 : 6NaFe_2'''(SiO_3)_2 : 4(Ca, Na_2)Fe_2'''SiO_6$.

Occurrence

Occurs as a rock constituent in the endomorphic contact zone of the aegirite-riebeckite-granite in the region of Ampasibitika, Ampasindava Bay, Madagascar. It is in both the altered limestone, associated with aegirite, garnet, epidote, orthoclase, albite, and calcite; and in the granite itself, as an alteration product of riebeckite.

Discussion

[To be classed as a variety of aegirite until the relations of this group of minerals are more fully worked out. E. T. W.]

ABSTRACTS—MINERALOGY

SOME OF THE RELATIONS OF MAGNETITE AND HEMATITE. T. M. Broderick. *Econ. Geol.*, **14**, 353–366, 1919.

The view of Sosman and Hostetter (abstd. in *Am. Min.*, **3**, 187, 1918) that solid solution of magnetite in hematite is of wide occurrence in natural minerals is criticized. When some of the specimens thought to be good illustrations of this phenomenon are examined on polished surfaces, admixed magnetite can be detected. Solid solution may occur, but not so frequently as has been supposed. E. T. W.

THE DEPOSITS OF ORPIMENT AND REALGAR AT LUCERAM AND DURANUS, MARITIME ALPS. J. Orcel. *Bull. soc. franc. min.*, **41**, 176–180, 1918.

The ocurrences of these minerals are described in detail, with brief crystallographic data. E. T. W.

NEW METHOD OF ANALYSIS OF PLATINUM ORES AND COMPOSITION OF THE NATIVE PLATINUMS OF THE URALS. Louis Duparc. *Helvetica Chim. Acta*, **2**, 324–337, 1919; thru *Chem. Abstr.*, **13** (20), 2495, 1919.

Includes discussions of the occurrence of platinum in the Urals, and analyses of some 12 samples, showing considerable amounts of associated metals such as osmium, iridium, rhodium, iron, etc. E. T. W.

MAGNESITE AS RAW MATERIAL. Thomas Crook. *Trans. Ceramic Soc.*, **18**, 67–147, 1919; *Mining Mag.*, **20**, 115, 1919; thru *Min. Abstr.*, **1**, 15, 1920.

A review of the economic occurrence and uses of magnesite, breunnerite, and hydromagnesite for refractory purposes. Magnesium and iron carbonates form a continuous isomorphous series and definite compounds do not exist.
W. F. H.

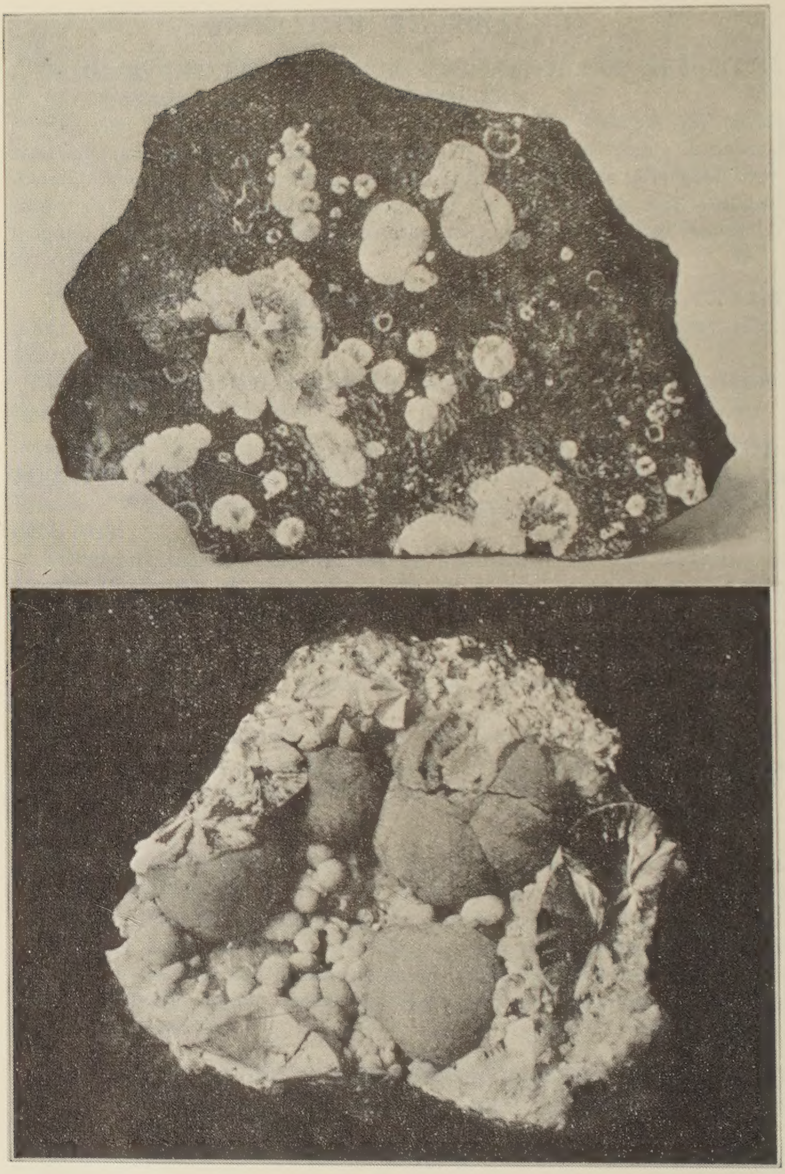
THE NITRATE OCCURRENCES IN THE DISTRICTS OF PRIESKA AND HAY, CAPE PROVINCE. G. E. B. Frood and A. L. Hall. Union of S. Africa, Geol. Survey, *Mem.* **14**, 1–51, 1919; thru *Min. Abstr.* **1**, 16, 1920.

Irregular deposits of KNO_3 are found in many places along faces of cliffs, in caves, or as veins and pockets in shale. Thru bacterial action the nitrogenous matter of organic remains has been oxidized to the nitrate, the shale supplying the potash. W. F. H.

CORUNDUM OF THE ZOUTPANSBERG FIELDS AND ITS MATRIX. P. A. Wagner. *Trans. Geol. Soc. South Africa*, **21**, 37–42, 1918; thru *Min. Abstr.* **1**, 15, 1920.

Loose crystals of corundum measuring up to 25 cm. in length and 13 cm. in diameter, and fragments, are found on the surface in the Zoutpansberg and Pietersburg districts of northern Transvaal. Analyses show Al_2O_3 80.68–87.13; SiO_2 7.35–10.05; Fe_2O_3 2.46–2.71. The matrix is in some cases a corundum-bearing diorite pegmatite, while in others it appears to be a quartz rock or a mica schist. W. F. H.

PLATE 6.



(× 1/3)

Pectolite, West Paterson, N. J.

(Radiated Disks and Mammillated)

Florence P. Manchester Memorial Collection, Fall River, Mass.